

SHLESINGER, ARKWRIGHT & GARVEY LLP

PATENT, TRADEMARK & COPYRIGHT LAW

ESTABLISHED 1950

3000 SOUTH EADS STREET
ARLINGTON, VIRGINIA 22202
TELEPHONE: (703) 684-5600

FAX: (703) 836-5288

FAX: (703) 836-5698

OUR REF. No. 6887

August 23, 1999

ROCHESTER, NEW YORK
SHLESINGER & FITZSIMMONS

OF COUNSEL

B. EDWARD SHLESINGER, JR.
GEORGE A. ARKWRIGHT
GEORGE A. GARVEY
DONALD C. KOLASCH

JAMES E. SHLESINGER
JOSEFINO P. DE LEON
MICHAEL M. ZADROZNY*
TERRENCE L.B. BROWN*
GLEN L. GROSS*

J. MARTON
PATENT AGENT

REGISTERED TO A BAR OTHER THAN VIRGINIA

Honorable Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Dear Sir:

Enclosed please find a Rule 53 non-provisional patent application
for filing as identified below:

Inventors: Britta DAUME

Title : A DEVICE FOR CONTACTING IN PARTICULAR ELONGATED,
ILLUSTRATIVELY SUBSTANTIALLY CYLINDRICAL BODIES
SUCH AS CABLES OR PIPES/TUBES

Drawings : Eight(8) sheets of drawings depicting
Figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12,
13, 14, 15 and 16.

Small Entity

Other

(Verified Statement Attached)

Basic Fee -----\$380.00

Basic Fee -----\$760.00

___ Claims over
20 x \$9.00-----\$

___ Claims over
20 x \$18.00-----\$

___ Independent claims
over 3 x \$39.00--\$

___ Independent claims
over 3 x \$78.00----\$

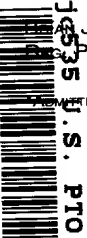
___ Mul. Dep. Claims
\$130.00-----\$

___ Mul. Dept. Claims
\$260.00-----\$

TOTAL FILING FEE \$

TOTAL FILING FEE \$

08/23/99



A Claim for priority is made based on German Application No. 298 15 063.8, filed August 24, 1998 and German Application No. 198 41 199.5 filed September 9, 1998.

___ A check in the amount of \$_____ is attached to cover the filing fee, should this amount be insufficient, then please debit Deposit Account No. 19-2105 and notify the undersigned in due course.

___ Do not charge any fees to Deposit Account No. 19-2105.


X This application is being filed under Rule 53.

Respectfully submitted,

SHLESINGER, ARKWRIGHT & GARVEY, LLP

Date: AUGUST 23, 1999

By


Michael M. Zadrozny
Reg. No. 30,985

ceq

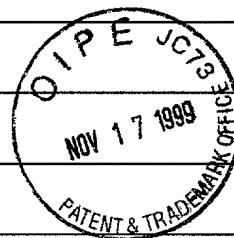
367 1012 US

Attorney's Docket No. 6887

Applicant or Patentee: Britta Daume

Serial or Patent No.: 09/382,202

Filed or Issued: August 23, 1999



For: A DEVICE FOR CONTACTING IN PARTICULAR ELONGATED,
ILLUSTRATIVELY SUBSTANTIALLY CYLINDRICAL BODIES
SUCH AS CABLES OR PIPES/TUBES

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) and 1.27 (c)) - SMALL BUSINESS CONCERN**

I hereby declare that I am

- () the owner of the small business concern indicated below:
- () an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Karin Daume Maschinenteile, GmbH & Co. KG

ADDRESS OF CONCERN Engenser Weg 1, 30938 Burgwedel, Germany

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled **A DEVICE FOR CONTACTING IN PARTICULAR ELONGATED, ILLUSTRATIVELY SUBSTANTIALLY CYLINDRICAL BODIES SUCH AS CABLES OR PIPES/TUBES**

by inventor(s) **BRITTA DAUME**

described in

- ☐ () the specification filed herewith
☒ (X) application Serial No. 09/382,202, filed August 23, 1999
☐ () patent no. _____, issued _____.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Name _____

Address _____

☐ () individual ☐ () small business concern ☐ () nonprofit organization

Name _____

Address _____

☐ () individual ☐ () small business concern ☐ () nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING BRITTA DAUME

TITLE OF PERSON OTHER THAN OWNER Executive Manager

ADDRESS OF PERSON SIGNING Engenser Weg 1

SIGNATURE B. Daume DATE 25.10.99

Britta DAUME

5

10

A DEVICE FOR CONTACTING IN PARTICULAR ELONGATED,
ILLUSTRATIVELY SUBSTANTIALLY CYLINDRICAL BODIES
SUCH AS CABLES OR PIPES/TUBES

15

Field of the Invention

The present invention relates to a device for contacting, in particular, elongated, illustratively substantially cylindrical bodies such as cables or pipes or tubes, where hereafter the word "pipe" also includes the meaning of "tube".

20

Background of the Invention

25

30

A device of the above kind is known from the European patent document A 0 744 788. It is used to set up an electrically conducting connection between a pipe or a bared outer conductor of a coaxial cable and a conductor, for instance a grounding cable. The known device comprises a base structure in the form of a clamp, this base structure being fitted with a band-shaped metal part imbedded in an elastic material, for instance rubber, forming sealing lips mutually spaced in the axial direction of the base structure. The sealing lips are fitted with rest surfaces by means of which, in the assembly position, the base structure rests against the body to be contacted, the sealing lips sealing a space, which in the

assembly position is subtended between the base structure and the body to be contacted, against penetration of air and/or moisture. Moreover the known device comprises contact means to implement an electrically conducting connection between the body to be contacted and a conductor, for instance a grounding cable. In the known device, the contact means consist of a separate adapter in the form of a band copper braid resting, in the assembly position, on one hand against the body to be contacted and on the other hand against the side of the band-shaped metal part of the base structure facing the body to be contacted. The adapter is joined to the base structure adhesively or by spot welds.

The known device incurs a drawback in that its manufacture entails connecting the separate adapter in an additional operational stage to the base structure and therefore being laborious and costly. This device suffers from a further drawback in that spot bonding between the adapter and the base structure carries the danger that the adapter may slip when being connected to the base structure during manufacture and accordingly will not be affixed in the desired position to the base structure. If so, the assembly of the device of the invention may require detaching the adapter from the base structure to move it into the desired position. Such a procedure is laborious and raises assembly costs. Moreover the connection implemented solely by spot welds raises the danger that the adapter may come loose off the base structure and be lost. In such a case, before the known device will be assembled, a new adapter must be secured,

entailing complexity and increasing both material and assembly costs.

Objects and Summary of the Invention

5 The objective of the invention is to create a device defined in the preamble of claim 1 which shall be free of the drawbacks of the known device, that is, which shall allow simple and economical manufacture and installation.

10 The disclosure of the invention abandons the concept of forming the contact means implementing an electrically conducting connection between the body to be contacted and a conductor, for instance a grounding cable, by means of a spot-bonded adapter. Instead the concept of the invention is to constitute the contact means by part of the base structure.
15 For that purpose the invention provides that the base structure comprise at least one contact protrusion made of an electrically conducting material. A separate adapter, illustratively consisting of band copper braid, therefore no longer is required and as a result the manufacture of the
20 device of the invention is simpler and more economical.

 The contact means being formed by part of the base structure, there is no danger either it might be lost as there is for the known devices.

25 The shape, size and position of the -- or each -- contact protrusion can be selected within wide limits according to particular requirements. The number of contact protrusions as well can be selected within wide limits. In a variant of the invention, the -- or each -- contact

protrusion consists of an element firmly bonded to the base structure. Illustratively the -- or each -- contact protrusion may be a sheetmetal firmly joined to the sheetmetal of the base structure by welding and projecting from the base structure toward the body to be contacted. Because of the thorough bonding of the contact-protrusion forming part to the base structure, this part is unshakably held at the base structure. Welding allows thoroughly bonding the two components in simple and economic manner and as a result the manufacturing costs of the device of the invention are low.

Essentially the -- or each -- contact protrusion may be made of an arbitrary, electrically well conducting material as long as the contact protrusion when in the assembly position between the body to be contacted and an electrically conducting conductor connected to the contact protrusion, for instance a grounding cable, be sufficiently conducting to assure shunting any currents, for instance from lightning, through the grounding cable. In order to minimize as much as possible the electrical resistance of the contact protrusion, the -- or each -- contact protrusion shall appropriately be metallic.

In an unusually advantageous embodiment of the invention, the -- or each -- contact protrusion is integral with the base structure or part thereof. In this manner a separate component no longer is required to constitute the contact means. This feature substantially simplifies manufacturing the device of the invention and makes it accordingly more economical.

In a further embodiment, the -- or each -- contact protrusion is elastically deforming in such manner that in the assembly position it will rest in resilient manner against the electrically conducting part of the body to be contacted. An especially reliable electrical connection is achieved in this embodiment on account of the resilient application of the contact protrusion against the electrically conducting part of the body to be contacted. Furthermore the resilient application of the -- or each -- contact protrusion will compensate for component tolerances.

In one embodiment of the invention, the electrically conducting connection of the -- or each -- contact protrusion and the body to be contacted can be further improved by springs biasing the -- or each -- contact protrusion toward the body to be contacted.. By appropriately selecting the spring bias, the force with which the -- or each -- contact protrusion in the assembly position rests against the body to be contacted can be selected within wide limits to meet the particular requirements.

In principle the base structure can be made substantially rigid. However an appropriate variant provides that the base structure be flexible. In this variant the base structure follows, on account of its flexibility, the surface of the body to be contacted. This feature also allows contacting strongly non-planar or curved bodies. The bodies to be contacted may be arbitrary, for instance they may be planar, bar-shaped, arbitrarily bent or curved or tubular and of arbitrary cross-section.

In another embodiment, the base structure comprises a band-shaped or plate-shaped contact element made of an electrically conducting material, preferable a metal. In variants of the above embodiment, the base structure is fitted at its side facing the body to be contacted in the assembly position with at least one protrusion at which the contact element is held and thereby forms the contact protrusion, or the -- or each -- contact protrusion is formed at the side of the contact element facing the body to be contacted in the assembly position.

In another, especially advantageous variant of the above embodiment, the - or each -- contact protrusion consists of an embossing in the contact element. If illustratively the contact element is a metal band, the metal band can be appropriately embossed to form the -- or each -- contact protrusions. This is a simple design and can be manufactured economically. The shape and size of the contact protrusion can be selected within wide limits by appropriately embossing the metal band.

In a variant of the above embodiment, the -- or each - embossing consists of a bulge which in the assembly position is cross-sectionally convex toward the body to be contacted and in top view in particular is circular, or a bead projecting toward the body to be contacted. Illustratively the contact protrusion may be implemented by embossing the metal band with a bulge which is cross-sectionally convex toward the body to be contacted and which in topview in particular is circular. In this manner the - or each - contact protrusion

can be formed in especially simple manner when the device of the invention is being manufactured. When assembling the device of the invention, this contact protrusion, first being in spot form, and thereupon, with elastic deformation, in increasingly planar form, comes to rest against the body to be contacted and as a result a reliable electrically conducting connection is achieved in the desired manner. In corresponding manner, beads of arbitrary shapes may be embossed into the metal band to form contact protrusions. The contact protrusions of this embodiment consisting of embossings, openings are not required in the base structure that otherwise, in the assembly position, might admit external air and/or humidity when into the contact zone. As regards contacting pipes, the device of the invention for instance may consist solely of a clamping band, the side of this band facing the pipe to be contacted when in the assembly position comprising sealing lips. Such an embodiment is especially simple and economical to manufacture.

In another embodiment of the invention, the - or each - contact protrusion consists of a blade projecting toward the side of the base structure which in the assembly position faces the body to be contacted, the - or each - blade optionally being stamped out of the contact element in a further variant. Again this embodiment allows especially simple and economic manufacture.

In another embodiment, a portion of the contact element passes out of the base structure in its assembly position to its side facing away from the body to be contacted or the

contact element is connected in electrically conducting manner to an element passing out of this side of the base structure. In this embodiment the contact element when in the assembly position can be contacted from the outside, for instance by attaching a grounding cable to the outside element. This feature facilitates the assembly of the device of the invention.

Depending on particular requirements, the base structure of the device of the invention may assume an arbitrary design, for instance being flat or plate-shaped to connect flat or plate-shaped bodies, or being bent or curved to contact bent or curved bodies. Appropriately, to contact elongated, in particular substantially cylindrical bodies, the base structure is designed in such manner that in the assembly position it shall enclose the body to be contacted in annular form or like a bush. The base structure of this embodiment is kept especially reliably against the body to be contacted.

In another appropriate embodiment, the base structure is in the form of a clamp which can be tensioned around the body to be contacted. In this embodiment there is greater reliability yet in connecting the device of the invention to the body to be contacted and assembly is simplified further still.

As regards the two above embodiments, the - or each - contact protrusion appropriately is a radial projection.

A variant of the above embodiment, the - or each - contact protrusion runs in the circumferential direction of the base structure substantially over the full length of this

structure. As a result there is large-area contact with the body to be contacted and hence a reliable, electrically conducting connection. The large-area contact with the body to be contacted substantially negates the effects of component tolerances on the electrical connection between the device of the invention and the body to be contacted.

In another variant, at least two mutually spaced-apart contact protrusions preferably mounted along a circumferential line on the base structure and spaced apart are used. In this manner contact is set up with the body to be contacted at several circumferential sites.

In another embodiment of the invention, illustratively for contacting pipes or cables, the base structure consists of at least two mutually connectable parts which in the assembly position are consecutive along the circumference of the body to be contacted. In this embodiment the base structure consists of several segments. Illustratively the base structure may consist of two semi-annular parts.

In another and especially advantageous variant, the base structure is integral and open in the circumferential direction and is fitted at its free ends with brackets which can be joined to one another when in the assembly position. Because the base structure is integral, assembly of the device of the invention is made easier. By joining the brackets to each other, the device of the invention is affixed more rapidly and in simple manner to the body to be contacted.

The brackets may be joined to each other in arbitrary manner, for instance being welded together. However an

advantageous variant provides that the brackets shall be joined to each other by screws or a clamp. This feature further simplifies the assembly of the device of the invention. Moreover the mutual connection of the brackets and hence the connection of the device of the invention to the body to be contacted is detachable in this variant. As a result the device of the invention is optionally re-usable.

In another embodiment, the base structure comprises a part made of an elastic material with which the side facing the body to be contacted in the assembly position is connected to the contact element. If the base structure is in the form of a clamp, the elastic part will deform when the clamp is being tightened and as a result will tighten the contact element toward the body to be contacted, thereby implementing an especially reliable electrical connection to the body to be contacted.

In the above embodiment the elastic part may form a coating of the contact element, or the contact element may be imbedded at least in part in the elastic material. In order to render the device of the invention optically more advantageous and/or to protect it against ambient effects, the contact element may be fitted with a thin, optionally colored film. However the contact element also may be fitted with the said elastic material to achieve electrical insulation or be imbedded in it.

The elastic material can be selected within wide limits in relation to the particular requirements. Advantageously this elastic material shall be an elastomer, in particular a

thermoplastic elastomer. Consequently the manufacturing costs of the device of the invention are lowered. Arbitrary elastomers may be used, for instance vulcanized rubber. Because easily processable, thermoplastic elastomers are especially advantageous.

In a further variant of the embodiments comprising an elastic part, the contact element is connected to the radial inside surface of the elastic part, and a band-shaped tightening band to tighten the device of the invention around the body to be contacted is attached to the radial outside surface of the elastic part, preferably in firmly affixed manner. The clamp makes it possible to tighten the device of the invention around the body to be contacted, the contact element then being firmly pressed against this body and the elastic material between the clamp and the contact element being compressed, whereby the contact element is biased toward the body to be contacted. Because of this biasing action, reliable electrical connection between the contact element and the body to be contacted shall be achieved even when tension of the tensioning part should slacken over time.

In a variant of the above embodiment, the tensioning part is metallic and the contact element is connected in electrically conducting manner with this tensioning part. In this design, a conductor, for instance a grounding cable, can be easily connected in the assembly position of the device of the invention to the externally accessible clamping part and, as a result of the electrical connection between the clamping

part and the contact element, the body to be contacted shall be grounded in the desired manner.

In another variant, the contact element is fitted with terminals to hook up a conductor, for instance a grounding cable, in such manner that the conductor can be connected with the contact element resting in the assembly position against the body to be contacted to set up an electrically conducting connection between the conductor and the body to be grounded. The terminals facilitate hooking up a conductor, for instance a grounding cable.

As regards the embodiment of the base structure and the brackets as an integral unit, a variant of the above embodiment provides that the contact element shall constitute the brackets or extends as far as into the brackets and in that at least one aperture is present in one bracket and at least one threaded borehole in the other bracket, the borehole being opposite the aperture in the assembly position, and in such manner that in the assembly position the brackets shall be crossed by at least one preferably metallic, electrically conducting screw passing through the aperture and engaging the threaded borehole to connect the brackets to each other and to the conductor, for instance a grounding cable, the brackets thus constituting the terminals. This design is implemented in especially easy and rapid manner and therefore can be assembled economically. The conductor is hooked up in that, using at least one screw, on one hand the brackets are tightened to each other and on the other hand the conductor,

illustratively using a connecting grommet, is connected to the brackets in electrically conducting manner.

In an unusually advantageous variant of the embodiment comprising the elastic part, the elastic material at least partly consists of an electrically conducting elastic material comprising at least one protrusion constituting the contact protrusion. Because of the electrical conductivity of the elastic material the base structure illustratively may wholly consist of elastic material and consequently metal parts no longer shall be required. This feature facilitates the manufacture of the device of the invention. Recycling also is improved because the base structure is made of a single material.

In the above embodiment to achieve electrical conductivity, electrically conducting masses or particles are appropriately imbedded in the elastic material. By appropriately selecting the content of electrically conducting masses or particles in the elastic material, latter's conductivity can be selected within wide limits in relation to particular requirements.

In a variant of the above embodiment, the elastic conducting masses or particles are distributed substantially uniformly in the elastic material. In this manner the elastic material shall be uniformly conducting.

If for instance the device of the invention is to contact the outside surface of a metal pipe, it will suffice that the contact protrusion project perpendicularly to the rest surface as far as the region of this surface and rests against it in

the assembly position. If on the other hand the device of the invention makes contact with a bared coaxial-cable outer conductor radially recoiling against an insulating sheath, then the contact protrusion of the device of the invention must radially project so far that in the assembly position it shall rest against the bared outer conductor. In this respect a further variant of the invention provides that the - or each - contact protrusion projects so far beyond the rest surface in the assembly position and perpendicularly to it that in this assembly position it will come to rest against an electrically conducting segment of the body to be contacted, recoiling relative to a part of the body to be contacted against which rest the rest surfaces of the base structure. In this manner it is possible also to implement an electrically conducting contact with recessed parts of the body to be contacted.

In another embodiment, the device of the invention comprises sealing means to seal a space subtended between the body to be contacted and the device of the invention in the assembly position against penetration by air and/or moisture. This embodiment reliably prevents interference, and consequent oxidation, by air and/or moisture penetrating the contact zone at the outer surface of the body to be contacted.

In a variant of the above embodiment, the sealing means comprise elastic sealing lips at a side of the base structure facing the body to be contacted in the assembly position, said lips being mutually apart in the axial direction of the base structure and running in the circumferential direction of the

base structure and over its full length, and resting tightly against the outside surface of the body to be contacted in the assembly position. When contacting elongated, illustratively substantially cylindrical bodies such as pipes or cables using a device of the invention comprising a base structure enclosing this body in the assembly position, this embodiment reliably implements sealing and prevents air and/or moisture from entering the contact zone.

In another variant of the embodiment comprising sealing means and an integral base structure with brackets, the sealing means comprise elastic sealing surfaces constituted by the mutually facing bracket surfaces or a sealing element made of an elastic material being present between said surfaces in the assembly position, the sealing surfaces resting tightly against each other in the assembly position or against the sealing element and tightly adjoining the sealing lips in the circumferential direction of the base structure. Sealing is improved further in this manner.

In another embodiment, the contact element and/or the clamp are made of brass and/or high-strength brass and/or of low-alloyed copper. The electrical conductivity of these materials is especially good and accordingly the electrical resistance between a conductor such as a grounding cable the body to be contacted is low.

The invention is elucidated below in relation to various embodiments shown in the attached drawing.

Brief Description of the Drawings

Fig. 1 is a schematic perspective of a first embodiment of a device of the invention in the form of a clamp in the assembly position,

Fig. 2 is an axial section of the device of the invention of Fig. 1,

Fig. 3 is a schematic elevation of the radial inside surface of a device of the invention of Fig. 1,

Fig. 4 is a schematic radial section of the device of the invention of Fig. 1 in the assembly position,

Fig. 5 is a representation similar to Fig. 3 of a second embodiment of the device of the invention,

Fig. 6 is a view similar to Fig. 4 of the device of the invention of Fig. 5 in the assembly position,

Fig. 7 is a view similar to Fig. 2 of a third embodiment of the device of the invention,

Fig. 8 is a view similar to Fig. 3 of the device of the invention of Fig. 7,

Fig. 9 is a view similar to Fig. 2 of a fourth embodiment of the device of the invention,

Fig. 10 is a view similar to Fig. 4 of the device of the invention of Fig. 9,

Fig. 11 is a view similar to Fig. 2 of a fifth embodiment of the device of the invention,

Fig. 12 is a view similar to Fig. 4 of the device of the invention of Fig. 11,

Fig. 13 is a view similar to Fig. 2 of a sixth embodiment of the device of the invention,

Fig. 14 is a view similar to Fig. 4 of the device of the invention of Fig. 13,

Fig. 15 is a view similar to Fig. 4 of a seventh embodiment of the device of the invention, and

Fig. 16 is a view similar to Fig. 4 of an eighth embodiment of the device of the invention.

Detailed Description of the Preferred Embodiments

Identical or corresponding components in the Figures of the drawing are denoted by the same references.

Fig. 1 shows a device of the invention 2 comprising a flexible base structure 4 in the form of a clamp which in the assembly position shown in Fig. 1 rests against a conducting part of a body to be contacted, enclosing, like a bush, in the embodiment of Fig. 1, a bared outer conductor 6 of a coaxial cable 8. In this embodiment the base structure 4 is integral and open in the circumferential direction and comprises a band-shaped metal contact element 10 fitted with brackets 12, 14 which are substantially perpendicular to the clamp ends and which rest against each other in the assembly position. The bracket 12 comprises apertures 16, the bracket 14 comprises (not shown) threaded boreholes which, in the assembly position, are opposite the apertures 16 in such manner that by means of metal screws 18 passing through the apertures and engaging the threaded boreholes may connect the

brackets 12, 14 in the assembly position can be connected to each other and with a conductor, illustratively in this embodiment a grounding cable denoted by 20.

Moreover the base structure 4 comprises a part 22 made of an elastic material, for instance an elastomer, in particular a thermoplastic elastomer.

Fig. 2 shows that the elastic part 22 constitutes a radial outside surface 24 of the base structure 4 and that the contact element 10 is imbedded by its axial edges 26, 28 into the elastic material of the part 22. Sealing lips 30, 32 mutually apart in the axial direction of the base structure 4 are formed by the elastic material of the part 2 on the side 92 of the base structure 4 - in this embodiment at its radial inside surface - which in the assembly position faces the body to be contacted, and additional sealing lips 34, 36 are formed each axially external to the sealing lips 30, 32. Because not shown in the drawing, it is stressed here that the sealing lips 30, 32 and also the additional sealing lips 34, 36 substantially run over the full length of the base structure in its circumferential direction and, for the assembly position of the device 2 shown in Fig. 1, will tightly rest against the sheath of the coaxial cable 8. They seal a space subtended in the assembly position of the device of the invention 2 shown in Fig. 1 of the device of the invention 2 between the base structure 4 and the coaxial cable 8 to be contacted, subtending a contact zone 38 wherein an electrically conducting connection between the device of the

invention 2 and the outer conductor 6 of the coaxial cable 8 is implemented.

To implement an electrically conducting connection between the device of the invention 2 and the outer conductor 6 of the coaxial cable 8 to be contacted, the device of the invention 2 is fitted with contact protrusions of which Fig. 2 only shows one denoted by 40. Seen in cross-section, the contact protrusion is convex relative to the coaxial cable 8, while in top view it is substantially circular.

The device of the invention 2 operates as follows:

In order to implement an electrically conducting connection between the outer conductor 6 of the coaxial cable 8 to be contacted and the grounding cable 20, the device of the invention 2 is placed around a bared zone of the coaxial cable 8 and is tightened by the screws 18. In the process, the base structure 4, by means of rest surfaces 42, 44 constituted by the sealing surfaces of the sealing lips 30, 32, comes to rest against the sheath of the coaxial cable 8. The contact protrusion 40 projects perpendicularly to the rest surfaces 42, 44, that is in a direction symbolically denoted by an arrow 46 in Fig. 2, in the assembly position, so much beyond the rest surfaces 42, 44 that, in this assembly position, it comes to rest against the outer conductor 6 of the coaxial cable 8 which is radially recoiling, and an electrically conducting connection has thus been implemented between the contact element 10 and the outer conductor 6. Because the grounding cable 20 is connected through the screws 18 to the contact element 10, the desired electrically

conducting connection has been set up in this manner, and the outer conductor 6 is now grounded.

The contact protrusion 40 is elastically deformed during tightening of the base structure 4 so that this protrusion rests in resilient manner against the outer conductor 6 of the coaxial cable 8. In this manner reliable electrical connection between the grounding cable 20 and the outer conductor 6 is now secured.

Because the contact protrusion 40 is a part of the base structure 4, a separate element, for instance an adapter, no longer is required. This features simplifies the design of the device of the invention 2 and makes its manufacture more economical.

Fig. 3, an elevation of the radial inside surface of the base structure 4, shows that the contact protrusion 40 and a further contact protrusion 48 consist each, as seen in topview, of a circular salient formed in the contact element 10.

Fig. 4 is a schematic, radial section of the device of the invention 2 and shows that, besides the contact protrusions 40, 48, another contact protrusion 50 is present and that the contact protrusions 40, 48, 50 are mutually equidistant in the circumferential direction of the base structure 4.

Fig. 5 is an elevation of the radial inside surface of a second embodiment of the device of the invention 2 differing from that of Fig. 1 in that the contact protrusions consist of blades 52, 54 stamped out of the contact element 10.

Fig. 6 is a radial section of the device of the invention of Fig. 5 and shows that besides the blades 52, 54 another blade 56 is present, the blades 52, 54, 56 being equidistant from each other in the circumferential direction of the base structure 4 and are bent toward the side of the base structure 4 facing the outer conductor 6 to be contacted in the assembly position and project so much that they rest resiliently against the outer conductor 6.

Fig. 7 is an axial section of a third embodiment of the device of the invention 2 differing from that of Fig. 1 in that the salient in the contact element 10 forming the contact protrusion consists of a bead 52 running in the circumferential direction of the base structure 4 substantially over the entire length of the base structure 4 in that direction. The elastic part 22 tightly rests against the contact element 10 in the zone of the bead 58.

Fig. 8 is a schematic elevation of the radial inside of the device 2 of Fig. 7.

Fig. 9 is an axial section of a fourth embodiment essentially differing from that of Fig. 7 in that the elastic part 22 is mounted a distance away from the contact element 10 in the zone of the bead 58.

Fig. 10 shows a radial section of the device of the invention 2 of Fig. 9.

Fig. 11 is an axial section of a fifth embodiment of the device of the invention 2 differing from the above embodiments in the first place in that the contact element 10 consists of a flat, that is unembossed, metal band. The base structure 4

is fitted at its elastic part 22 with a radial protrusion 62 for the purpose of forming a contact protrusion 60, the contact element 10 being affixed to the radial inside surface of the protrusion 62 and in this manner forms the contact protrusion 60. In this embodiment the base structure 4 furthermore comprises a metal tensioning element 64 connected to the radially outside surface of the elastic part 22 to tension the device of the invention 2 around the body to be contacted. By means of an adapter 66 leading to the radially outside surface of the base structure 4, the contact element 10 is electrically connected to the tensioning element 64. The adapter 66 connects the grounding cable 20 to the contact element 10. When tightening the device of the invention 2 around the outer conductor 6 of the coaxial cable 8 to be contacted, the contact protrusion 60 of the contact element 10 is firmly compressed against the outer conductor 6 and the elastic part 22 is compressed as well, thereby forming spring means to bias the contact protrusion 60 toward the outer conductor 6.

Fig. 12 is a schematic radial section of the device of Fig. 11.

Fig. 13 shows a sixth embodiment of the device of the invention which differs from that of Fig. 12 in that the ends 68, 70 of the contact element 10 pass out of the base structure 4 in the vicinity of the brackets 12, 14, as a result of which the grounding cable 20 can be connected to the ends 68, 70 of the contact element 10.

Fig. 14 is a schematic radial section of the device of Fig. 13.

Fig. 15 shows a seventh embodiment similar to that of Fig. 14 wherein merely one end 68 of the contact element 10 passes out of the base structure 4.

Lastly Fig. 16 shows an eighth embodiment similar to that of Fig. 12 wherein the one end 68 of the contact element 10 runs radially outward through the part 22 to the tensioning element 64 and in this manner is connected in electrically conducting manner to the tensioning element 64.

While this invention has been described as having a preferred design, it is understood that it is capable of further modifications, and uses and/or adaptations of the invention and following in general the principle of the invention and including such departures from the present disclosure as come within the known or customary practice in the art to which the invention pertains, and as may be applied to the central features hereinbefore set forth, and fall within the scope of the invention or limits of the claims appended hereto.

I CLAIM:

1. A device to contact in electrically conducting manner an electrically conducting part of in particular an elongated, illustratively cylindrical body, for instance a pipe or a cable, comprising a base structure fitted with a rest surface to rest against the body to be contacted and further fitted with contact means to implement an electrically conducting connection between the body to be contacted and a conductor, for instance a grounding cable,

characterized in that

the base structure (4) comprises at least one electrically conducting contact protrusion (40) projecting to the rest surface (42, 44) in such manner that in the assembly position it will rest against the electrically conducting part (6) of the body to be contacted (8) and thereby constitutes the contact means.

2. Device as claimed in claim 1, characterized in that the - or each - contact protrusion (40) consists of a part firmly joined to the base structure (4).

3. Device as claimed in claim 1, characterized in that the - or each - contact protrusion (40) is metallic.

4. Device as claimed in claim 1, characterized that the - or each - contact protrusion (40) is integral with the base structure (4) or with part of the base structure (4).

5 5. Device as claimed in claim 1, characterized in that the - or each - contact protrusion (40) is elastically deformable in such manner that in the assembly position it will resiliently rest against the electrically conducting part (6) of the body to be contacted (8).

6. Device as claimed in claim 1, characterized by spring means to bias the - or each - contact protrusion (40) toward the body to be contacted (8).

7. Device as claimed in claim 1, characterized in that the base structure (4) is flexible.

8. Device as claimed in claim 1, characterized in that the base structure (4) comprises a band-shaped or plate-shaped contact element (10) made of an electrically conducting material, preferably a metal.

9. Device as claimed in claim 8, characterized in that in its assembly position the base structure (4) comprises at its side facing the body to be contacted (8) at least one projection on which is held the contact element (10) and in this manner forms the contact protrusion (40).

10. Device as claimed in claim 8, characterized in that the - or each - contact protrusion (40) is formed at the side of the contact element (10) facing the body to be contacted (8) in the assembly position.

11. Device as claimed in claim 10, characterized in that the - or each - contact protrusion (40) consists of an embossing in the contact element.

5 12. Device as claimed in claim 11, characterized in that the - or each - embossing is formed by a salient which is cross-sectionally convex toward the body to be contacted (8) in the assembly position or by a bead (58) projecting toward the body to be contacted (8).

10 13. Device as claimed in claim 10, characterized in that the - or each - contact protrusion (40) consists of a blade (52) projecting toward a side of the base structure (4) facing the body to be contacted (8) in the assembly position.

15 14. Device as claimed in claim 13, characterized in that the - or each - blade (52) is stamped out of the contact element (10).

20 15. Device as claimed in claim 8, characterized in that part of the contact element (10) is led out the base structure (4) to its side away from the body to be contacted (8) in its assembly position or that the contact element (10) is electrically connected with a part (66) led out to this side
25 of the base structure (4).

16. Device as claimed in claim 1, characterized in that the base structure (4) is designed in such manner that in the

assembly position it encloses the body to be contacted (8) in particular in annular manner or like a bush.

17. Device as claimed in claim 1, characterized the
5 base structure (4) is designed as a clamp which can be tensioned around the body to be contacted (8).

18. Device as claimed in claim 16, characterized in that
10 the - or each - contact protrusion (40) consists of a radial projection.

19. Device as claimed in claim 16,, characterized in
15 that the - or each - contact protrusion (40) runs in the circumferential direction of the base structure (4) substantially over the entire length of the base structure (4) in this direction.

20. Device as claimed in claim 16, characterized in
20 that at least two contact protrusion (40, 48, 50) are mounted in mutually spaced manner in the circumferential direction of the base structure (4), preferably along one circumferential line.

21. Device as claimed in claim 16, characterized in that
25 the base structure (4) consists of at least two mutually connectable parts consecutive along the circumference of the body to be contacted (8) in the assembly position.

22. Device as claimed in claim 16, characterized in that the base structure (4) is integral and circumferentially open and at its ends comprises brackets (12, 14) which are connectable in the assembly position.

5

23. Device as claimed in claim 22, characterized in that the brackets (12, 14) can be connected to each other by means of screws or a clamp.

24. Device as claimed in claim 8, characterized in that the base structure (4) comprises an elastic part (22) of which the side facing the body to be contacted (8) in the assembly position where called for is connected to the contact element (10).

10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

25. Device as claimed in claim 24, characterized in that the part (22) made of an elastic material constitutes a coating of the contact element (10) or in that the contact element (10) is imbedded at least in part in the elastic material.

20

26. Device as claimed in claim 24, characterized in that the elastic material is an elastomer, in particular a thermoplastic elastomer.

25

27. Device as claimed in claim 16, characterized in that the contact element is connected to the radial inside surface of the elastic part (22) and in that a band-shaped tensioning

element (64) to tension the device (2) around the body to be contacted (8) is mounted, preferably firmly to the elastic part (22), at the radial outside surface of the elastic part (22).

5

28. Device as claimed in claim 27, characterized in that the tensioning element (64) is metallic and that the contact element (10) is connected in electrically conducting manner to the tensioning element.

10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425
430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535
540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640
645
650
655
660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965
970
975
980
985
990
995
1000

29. Device as claimed in claim 8, characterized in that the contact element (10) is fitted with terminals to hook up a conductor, for instance a grounding cable (20) in such manner that the conductor by means of the contact element (10) resting against the body to be contacted (8) in the assembly position can be connected in electrically conducting manner to the body to be contacted (8).

20

25

30. Device as claimed in claim 22, characterized in that the contact element (10) constitutes the brackets (12, 14) or extends into the brackets (12, 14) and in that one bracket (12) comprises at least one aperture (16) and the other bracket (14) comprises at least one threaded borehole opposite the aperture (16) in the assembly position, in such manner that, in the assembly position, the brackets, (12, 14) by means of at least one electrically conducting metal screw (18) passing through the aperture (16) and engaging the threaded borehole, can be connected to each other and to the conductor,

illustratively a grounding cable (20), and thereby form the hookup means.

31. Device as claimed in claim 24, characterized in that
5 the elastic material at least in part consists of an electrically conducting elastic material and in that the elastic part (22) comprises at least one protrusion constituting the contact protrusion (40).

32. Device as claimed in claim 31, characterized in that
10 electrically conducting masses or particles are imbedded in the elastic material to implement electrical conductivity.

33. Device as claimed in claim 32, characterized in that
15 the electrically conducting masses or particles are substantially uniformly distributed in the elastic material.

34. Device as claimed in claim 32, characterized in that
20 the electrically conducting masses or particles consist of graphite and/or soot and/or metal, in particular of metal powders or metal fibers.

35. Device as claimed in claim 1, characterized in that
25 the - or each - contact protrusion (40) projects so far beyond the rest surface of the base structure (4) that in the assembly position it comes to rest against an electrically conducting part (6) of the body to be contacted (8) which

recoils opposite a part of the body to be contacted (8) supporting the rest surfaces (42, 44) of the base structure (4).

5 36. Device as claimed in claim 1, characterized in that the device (2) comprises sealing means to seal a space subtended in the assembly position between the body to be contacted (8) and the base structure (4) against penetration by air and/or moisture.

10 37. A device as claimed in claim 36, characterized in that the sealing means are fitted with elastic sealing lips (30, 32) at a side of the base structure (4) facing the body to be contacted (8) in the assembly position, said sealing
15 lips (30, 32) being mutually apart in the axial direction of the base structure and running in the circumferential direction of the base structure (4), preferably over the full length of the base structure (4) in this direction and resting in the assembly position of the device of the invention (2) in
20 sealing manner against the outside surface of the body to be contacted (8).

25 38. Device as claimed in claim 37, characterized in that the rest surface (42, 44) of the base structure (4) consists of sealing surfaces of the sealing lips (30, 32) to rest against the body to be contacted (8).

39. Device as claimed in claim 36, characterized in that the sealing means comprise sealing surfaces constituted by mutually facing surfaces of the bracket (12, 14) in the assembly position and made of an elastic material or sandwiching an elastic sealing element between them in the assembly position, the sealing surfaces in the assembly position resting in sealing manner against each other or against the sealing body and tightly adjoining the sealing lips in the circumferential direction of the base structure (4).

40. Device as claimed in claim 1. characterized in that the contact element (10) and/or the tensioning element (64) are made of brass and/or high-strength brass and/or low-alloy copper.

ABSTRACT

5 A device , used to contact in electrically conducting
manner an electrically conducting part of in particular an
elongated, illustratively substantially cylindrical body such
as a pipe or a cable , comprises a base structure fitted with
a rest surface with which to rest against the body to be
10 contacted and with contact means to set up an electrically
conducting connection between the body to be contacted and a
conductor, for instance a grounding cable. The device of the
invention is characterized in that the base structure
comprises at least one contact protrusion made of an
15 electrically conducting material and projecting
perpendicularly to and in the direction of the rest surface in
such manner that in the assembly position it will rest against
the electrically conducting part of the body to be contacted
and in this manner will form the contact means. The device of
the invention allows simple and economical manufacture and is
easily installed.

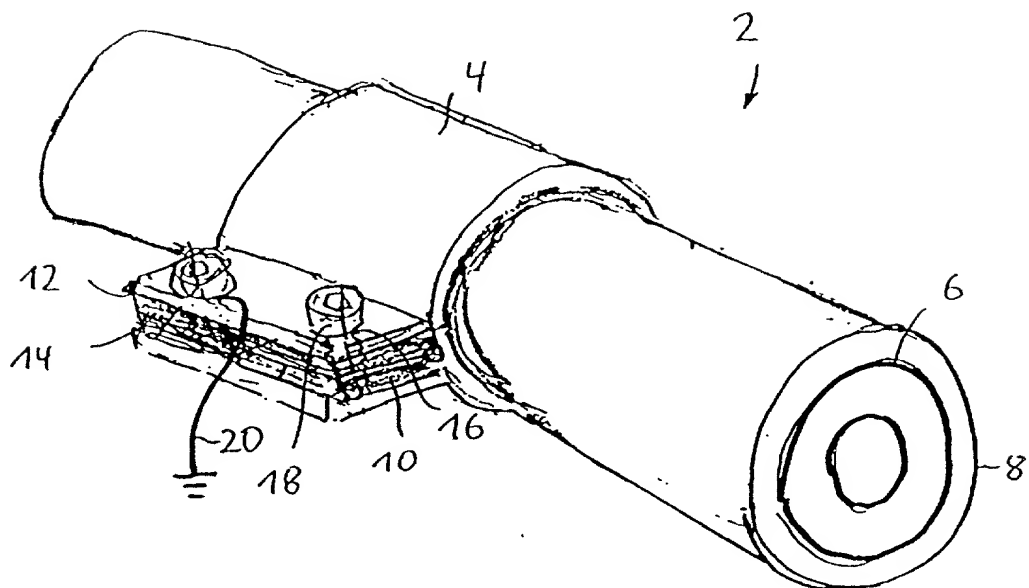


FIG. 1

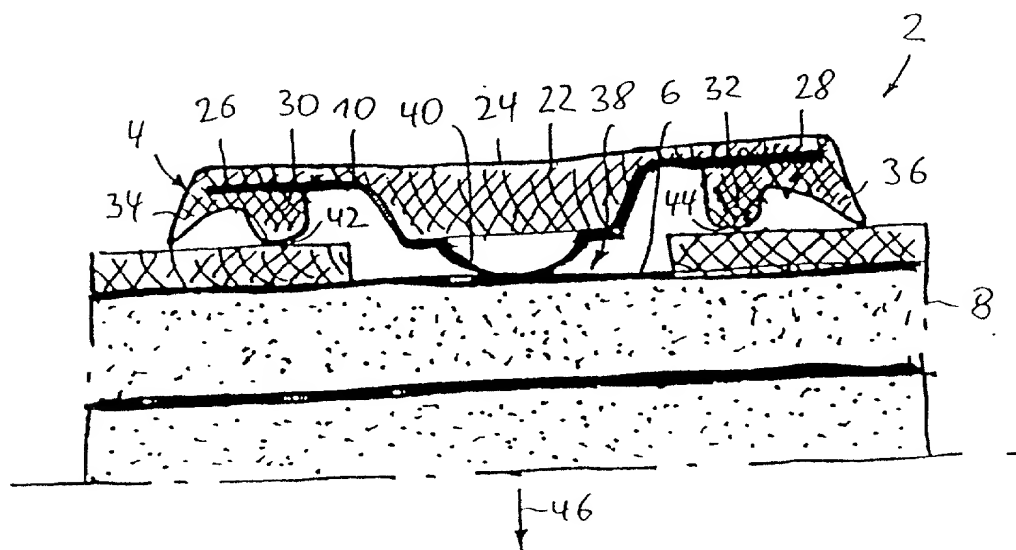


FIG. 2

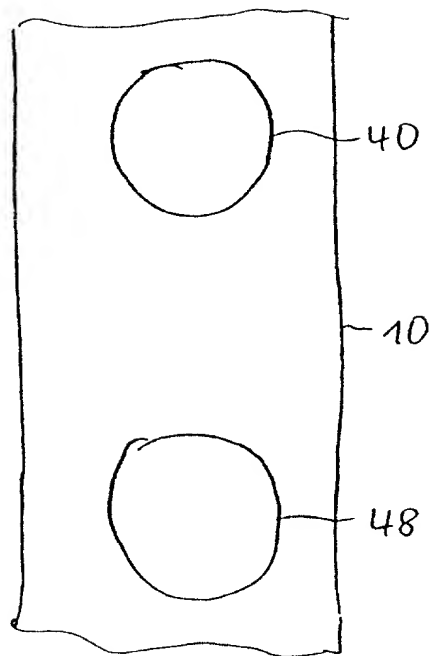


FIG. 3

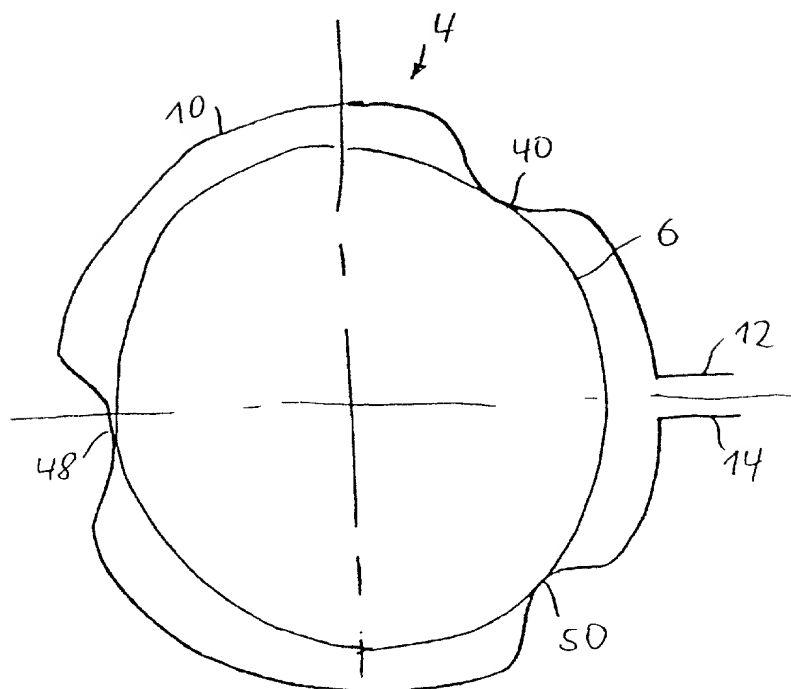


FIG. 4

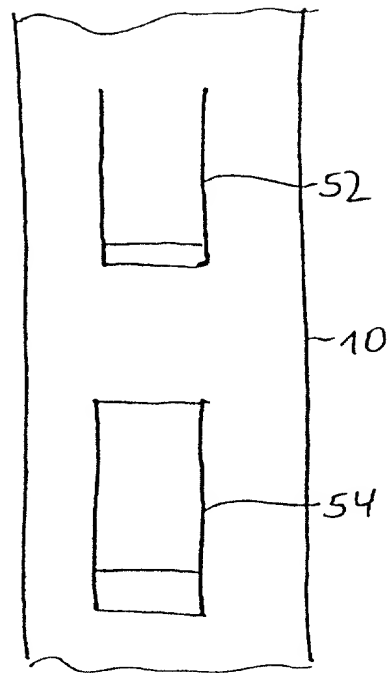


FIG. 5

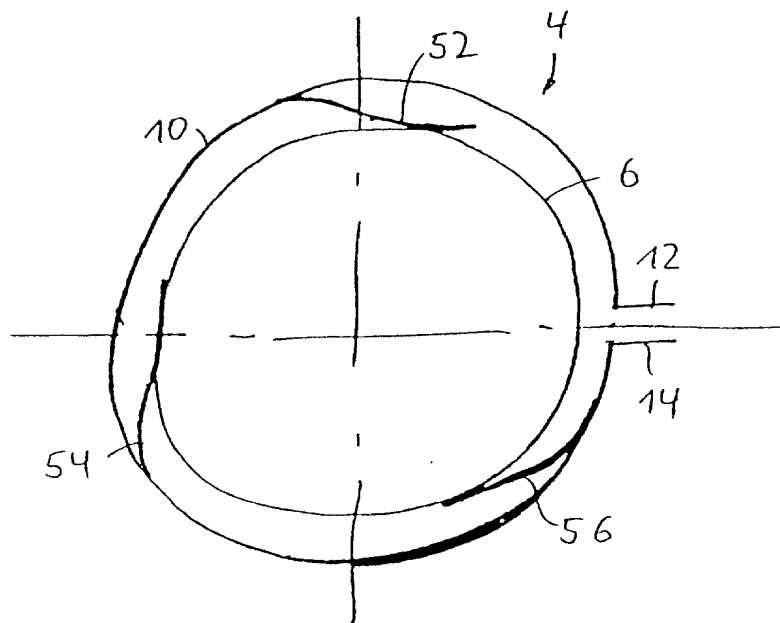


FIG. 6

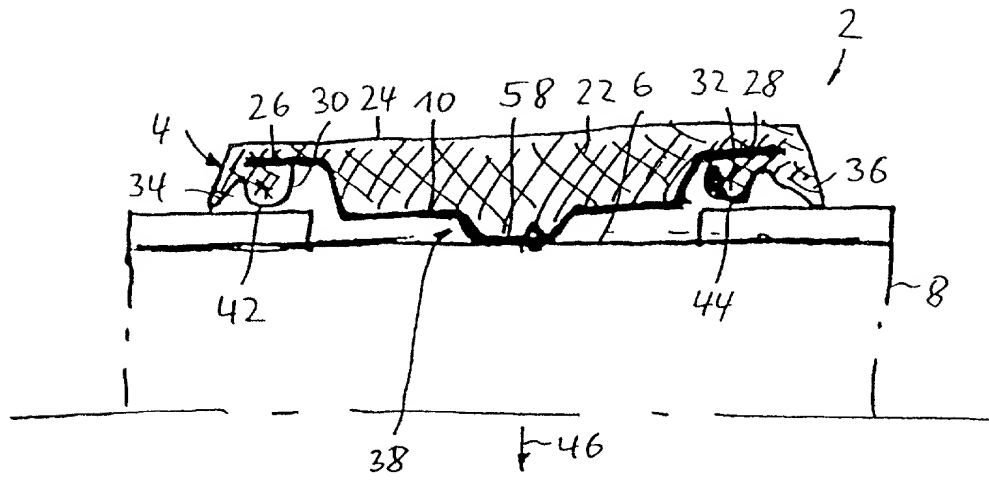


FIG.7

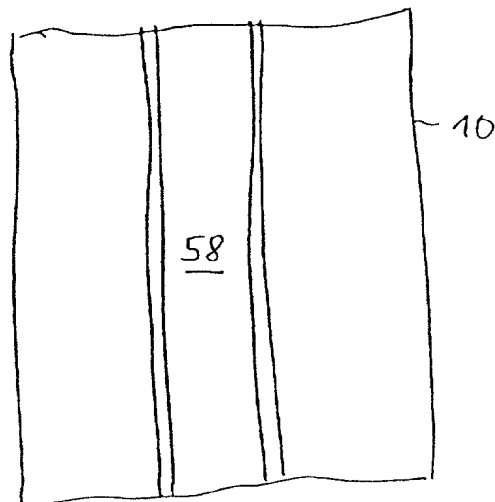


FIG.8

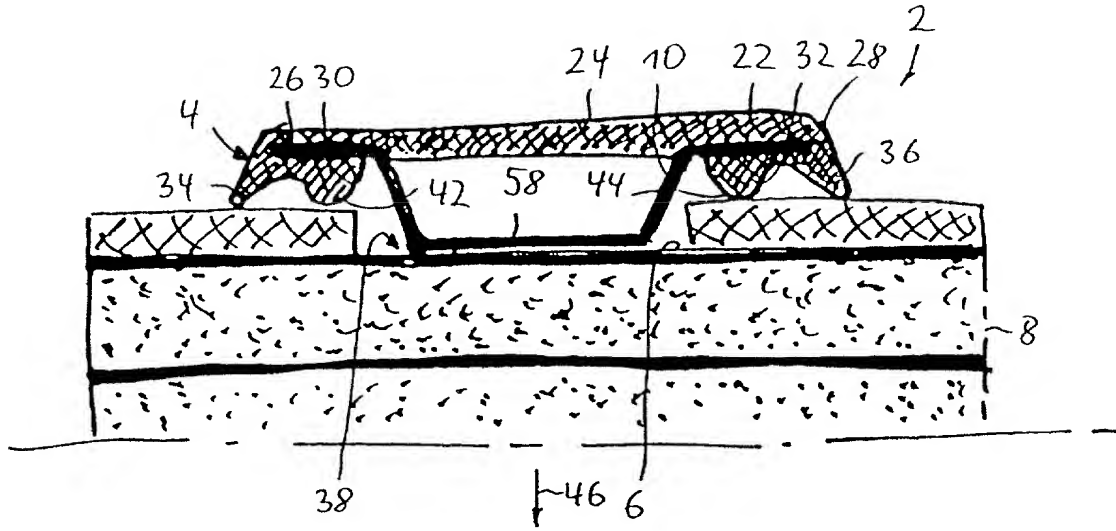


FIG. 9

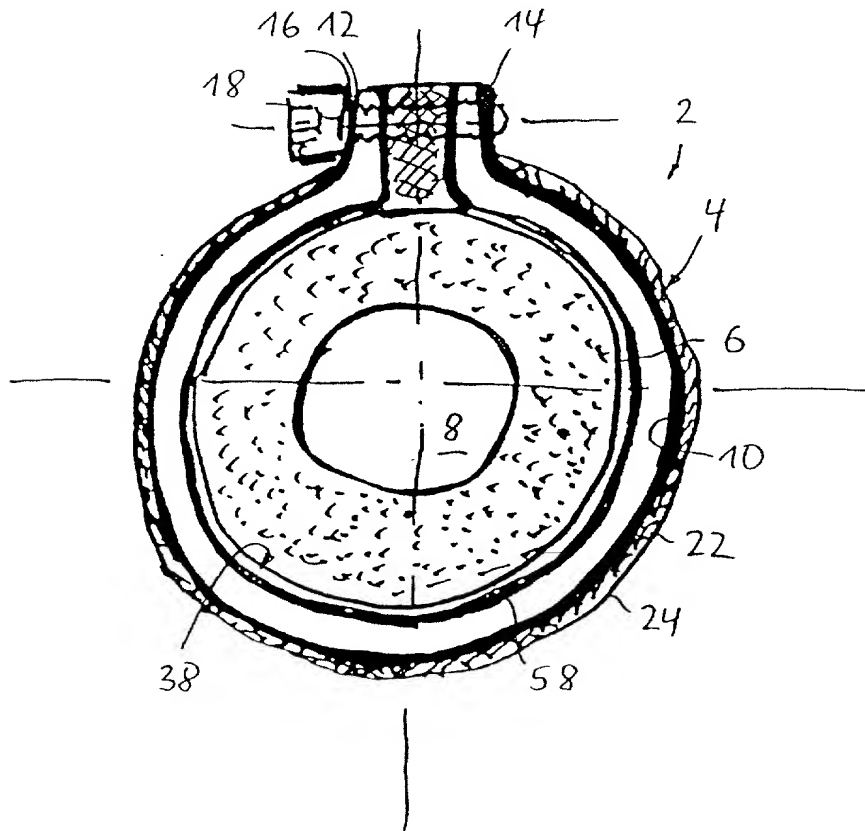


FIG. 10

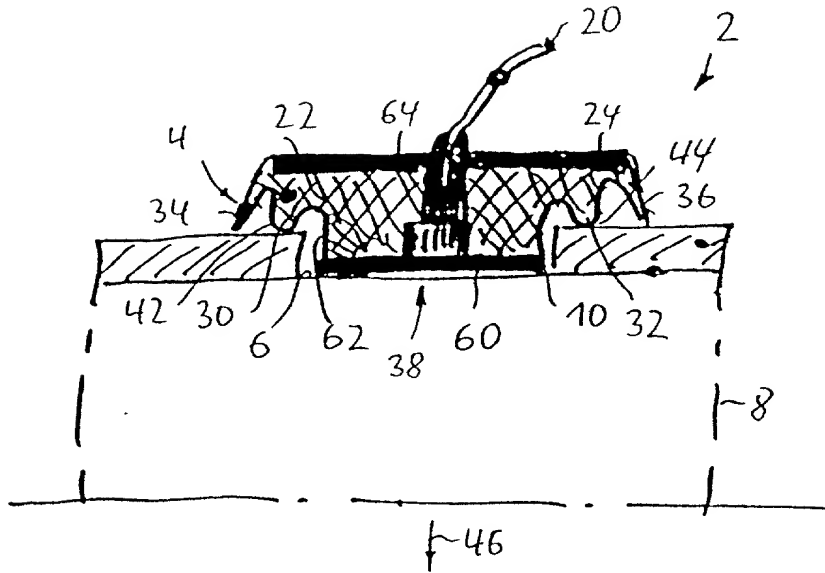


FIG.11

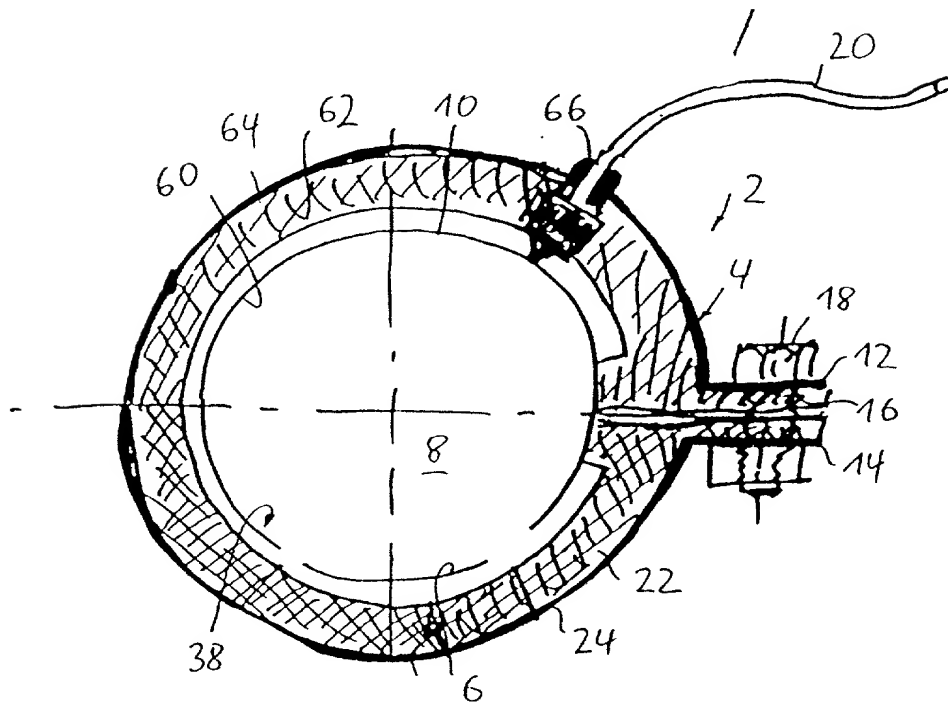


FIG.12

662280"TF8TF860

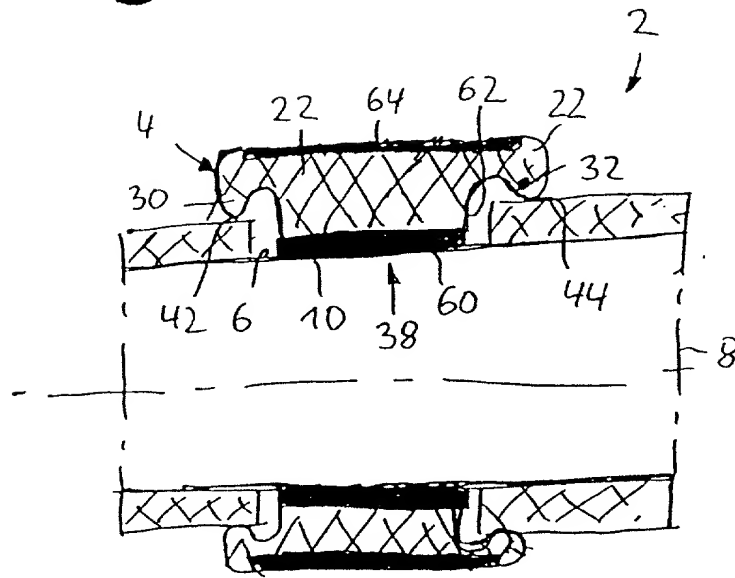


FIG. 13

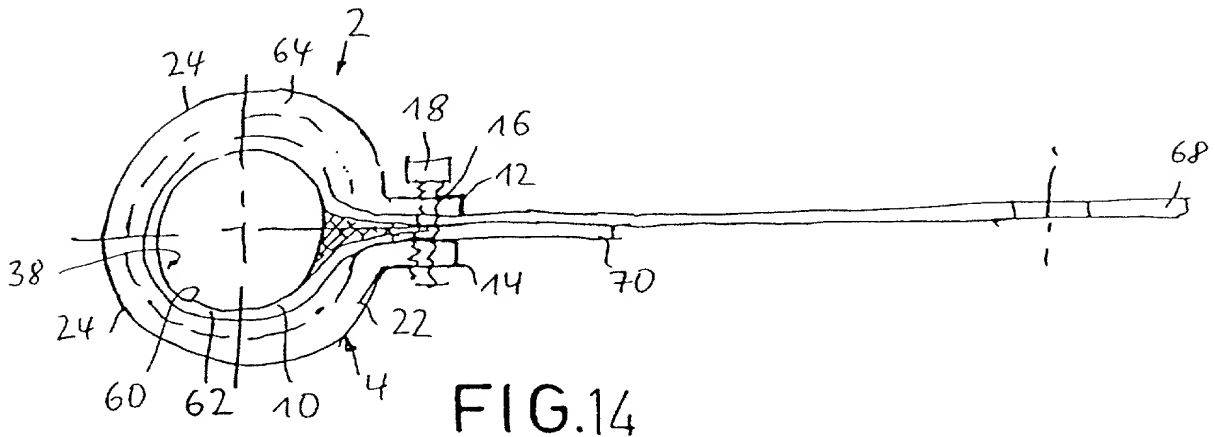


FIG. 14

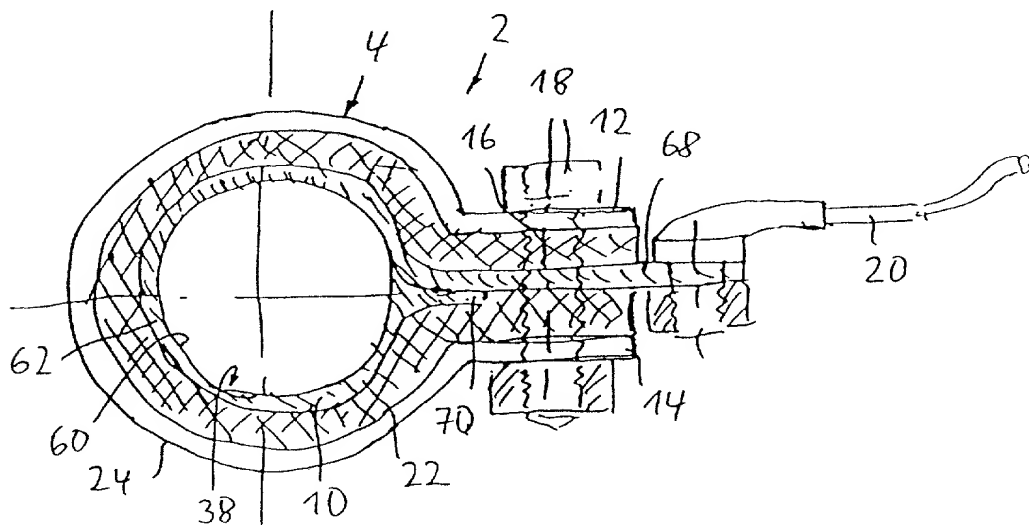


FIG. 15

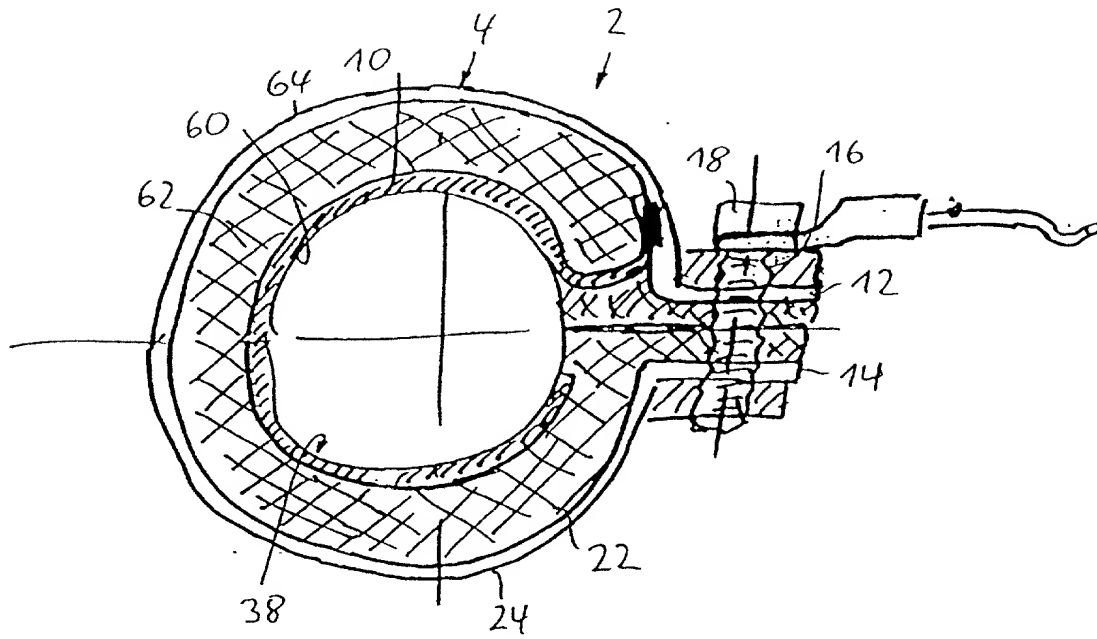
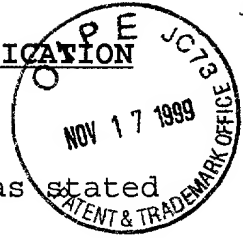


FIG.16

35-10243
#3

DECLARATION AND POWER OF ATTORNEY - ORIGINAL APPLICATION



As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below beneath my name:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which Letters Patent is sought on the invention entitled

A DEVICE FOR CONTACTING IN PARTICULAR ELONGATED, ILLUSTRATIVELY SUBSTANTIALLY CYLINDRICAL BODIES SUCH AS CABLES OR PIPES/TUBES

the specification of which
(check one)

is attached hereto
X was filed on August 23, 1999
as Application S.N. 09/382,202
and was amended on _____

09091841

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by an amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or invention certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)	Priority Claimed
<u>298 15 063.8</u> (Number)	<u>Germany</u> (Country)
<u>August 24, 1998</u> (Day/Month/Year Filed)	YES NO
<u>198 41 199.5</u> (Number)	<u>Germany</u> (Country)
<u>September 9, 1998</u> (Day/Month/Year Filed)	YES NO

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below:

(Application Ser. No.)

(Filing Date)

66220" T43F5450

I hereby claim the benefit under Title 35, United States Code, Sec. 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Sec. 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Sec. 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Ser. No.)	(Filing Date)	(Status)
		(patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

B. Edward Shlesinger, Jr., Reg. No. 17,225; George A. Arkwright, Reg. No. 20,158; George A. Garvey, Reg. No. 17,737; Josefino P. de Leon, Reg. No. 33,166; Terrence L. B. Brown, Reg. No. 32,685; Michael M. Zadrozny, Reg. No. 30,985; Brian J. Marton, Reg. Agent 30,292; and Glen L. Gross, Reg. No. 41,808.

SEND CORRESPONDENCE TO: SHLESINGER, ARKWRIGHT & GARVEY LLP
3000 South Eads Street
Arlington, Virginia 22202

DIRECT TELEPHONE CALLS TO Michael M. Zadrozny (703) 684-5600

The undersigned hereby authorizes the U.S. attorney(s) or agent(s) named herein to accept and follow instructions from Leine & Wagner as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney(s) or agent(s) and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney(s) or agent(s) named herein will be so notified by the undersigned.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that the statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Full name of sole or first inventor Britta DAUME

Inventor's signature *James* Date 25.10.99

Residence Engenser Weg 1, 30938 Burgwedel, GERMANY

Citizenship German

Post Office Address Same as above

Full name of second joint inventor _____

Inventor's signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Parameter	1990-1991		1991-1992		1992-1993		1993-1994		1994-1995		1995-1996		1996-1997		1997-1998		1998-1999		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005		2005-2006		2006-2007		2007-2008		2008-2009		2009-2010		2010-2011		2011-2012		2012-2013		2013-2014		2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-2022		2022-2023		2023-2024		2024-2025		2025-2026		2026-2027		2027-2028		2028-2029		2029-2030		2030-2031		2031-2032		2032-2033		2033-2034		2034-2035		2035-2036		2036-2037		2037-2038		2038-2039		2039-2040		2040-2041		2041-2042		2042-2043		2043-2044		2044-2045		2045-2046		2046-2047		2047-2048		2048-2049		2049-2050		2050-2051		2051-2052		2052-2053		2053-2054		2054-2055		2055-2056		2056-2057		2057-2058		2058-2059		2059-2060		2060-2061		2061-2062		2062-2063		2063-2064		2064-2065		2065-2066		2066-2067		2067-2068		2068-2069		2069-2070		2070-2071		2071-2072		2072-2073		2073-2074		2074-2075		2075-2076		2076-2077		2077-2078		2078-2079		2079-2080		2080-2081		2081-2082		2082-2083		2083-2084		2084-2085		2085-2086		2086-2087		2087-2088		2088-2089		2089-2090		2090-2091		2091-2092		2092-2093		2093-2094		2094-2095		2095-2096		2096-2097		2097-2098		2098-2099		2099-2100		2100-2101		2101-2102		2102-2103		2103-2104		2104-2105		2105-2106		2106-2107		2107-2108		2108-2109		2109-2110		2110-2111		2111-2112		2112-2113		2113-2114		2114-2115		2115-2116		2116-2117		2117-2118		2118-2119		2119-2120		2120-2121		2121-2122		2122-2123		2123-2124		2124-2125		2125-2126		2126-2127		2127-2128		2128-2129		2129-2130		2130-2131		2131-2132		2132-2133		2133-2134		2134-2135		2135-2136		2136-2137		2137-2138		2138-2139		2139-2140		2140-2141		2141-2142		2142-2143		2143-2144		2144-2145		2145-2146		2146-2147		2147-2148		2148-2149		2149-2150		2150-2151		2151-2152		2152-2153		2153-2154		2154-2155		2155-2156		2156-2157		2157-2158		2158-2159		2159-2160		2160-2161		2161-2162		2162-2163		2163-2164		2164-2165		2165-2166		2166-2167		2167-2168		2168-2169		2169-2170		2170-2171		2171-2172		2172-2173		2173-2174		2174-2175		2175-2176		2176-2177		2177-2178		2178-2179		2179-2180		2180-2181		2181-2182		2182-2183		2183-2184		2184-2185		2185-2186		2186-2187		2187-2188		2188-2189		2189-2190		2190-2191		2191-2192		2192-2193		2193-2194		2194-2195		2195-2196		2196-2197		2197-2198		2198-2199		2199-2200		2200-2201		2201-2202		2202-2203		2203-2204		2204-2205		2205-2206		2206-2207		2207-2208		2208-2209		2209-2210		2210-2211		2211-2212		2212-2213		2213-2214		2214-2215		2215-2216		2	
-----------	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	-----------	--	---	--